

RE-EXAMINATION OF THE VENATION OF *OSMYLOPSYCHOPS SPILLERAE* TILLYARD FROM THE TRIASSIC OF QUEENSLAND

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The finding of new material has permitted re-examination of the venation of the Triassic neuropteran *Osmylepsychops spilleriae* Tillyard. Many of the features of Tillyard's reconstruction of the forewing of the species are shown to be erroneous. □ *Osmylepsychops spilleriae*, Neuroptera, Insecta, Triassic, Queensland.

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In the last of his 10 part series on the Mesozoic insects of Queensland, Tillyard (1923) described a broad-winged psychopsid-like lacewing from the Triassic of Denmark Hill in south-eastern Queensland (27°37'S, 152°47'E) as *Osmylepsychops spilleriae* Tillyard. *Osmylepsychops* Tillyard was ascribed to the new family Osmylepsychopsidae by Martynova (1949) and, in 1953, Ellenberger et al. augmented the genus with their description of *O. radialis* from the Upper Triassic of France.

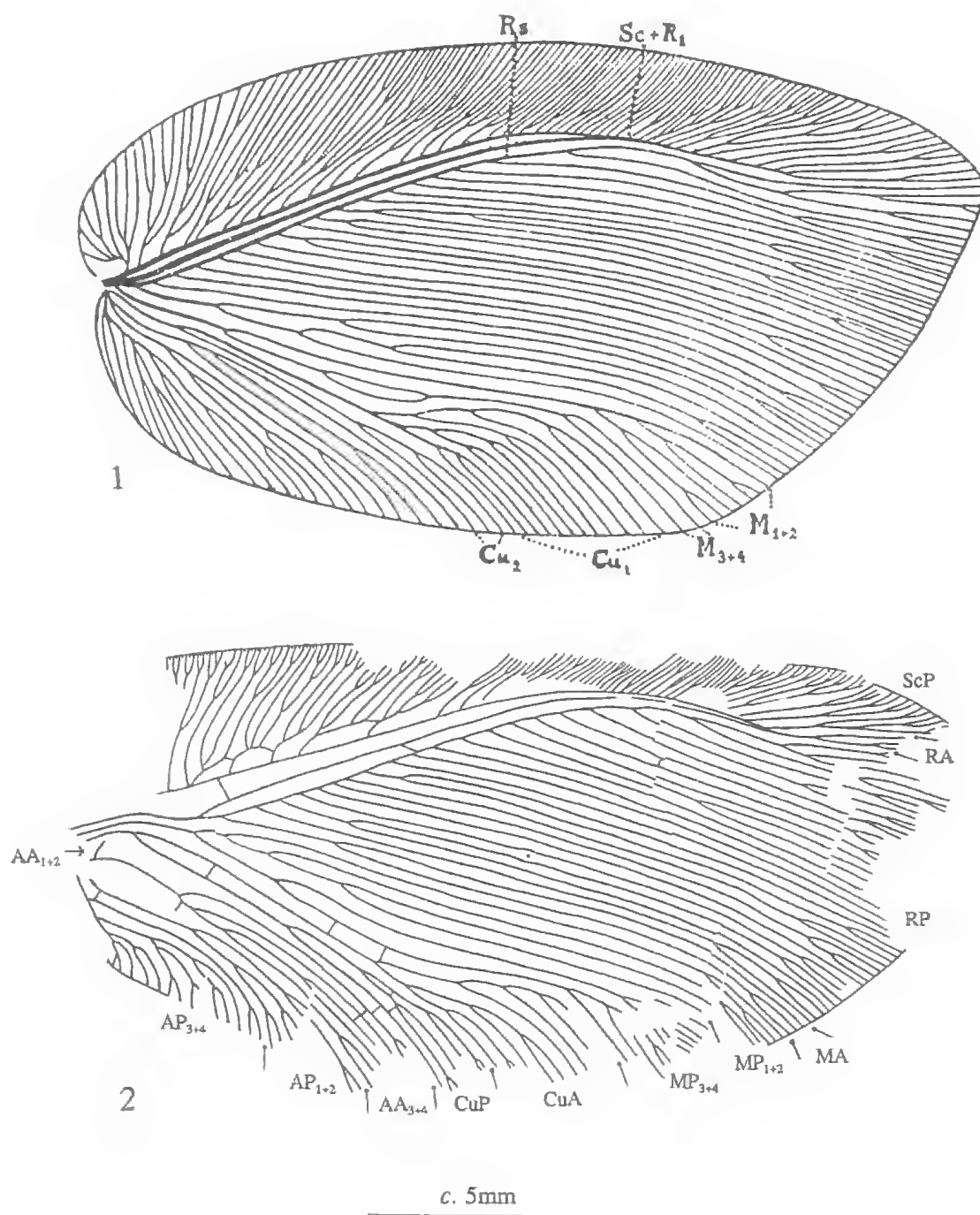
O. spilleriae was based on two wing fragments (Tillyard, 1923, pl. XLIII, figs 39,40), from which Tillyard 'reconstructed' the forewing venation (Fig.1). Because of the fragmentary nature of this type material (Figs3,4), much of the reconstruction was notional and, as often happens with such 'best guess' reconstructions, its publication and subsequent reproduction (e.g. Riek, 1970) entrenched in the literature an assumed to be accurate 'complete' venational scheme that became a baseline for subsequent comparisons with similar species.

The purpose of the present work is to provide a more accurate view of the venation of *O. spilleriae* and in so doing to exclude Tillyard's reconstruction, visually appealing though it may be, from the data set of fossil Neuroptera. The re-examination of the venation of the species has been made possible by the collection in more recent years of several specimens of *O. spilleriae* from the Triassic of Mount Crosby in south-eastern Queensland (27°32'S, 152°48'E), from where the species was first recorded by Riek (1955). Examination of this new material as well as of Tillyard's original Denmark Hill specimens provides an almost complete picture of the forewing venation of the species (see Fig.2).

Tillyard's material was collected in grey shales of the Blackstone Formation that were exposed in a small quarry at Denmark Hill, a suburb of the town of Ipswich (Dunstan, 1916). Mount Crosby fossil insects occur in green shales of the Mount Crosby Formation and have been collected at five separate exposures designated as Fossil Insect Localities A, B, C, D and E (details in Allen, 1961). Both Formations are Late Triassic (Karnian) and form part of the Ipswich Coal Measures, with the Mount Crosby Formation lower in the sequence (Cranfield et al., 1976).

With one exception, the determination of whether the isolated wing fragments described herein are of fore- or hindwings has not been possible. The closest living species for comparative purposes is the psychopsid *Megapsychops illidgei* (Froggatt). In this species the basic venational patterns of the fore- and hindwings are very similar (see Tillyard, 1919, pl. LXXVII, fig.4; New, 1988, figs196,197) and, because of this similarity, I believe it is valid, for the sake of convenience of discussion, to regard all wing fragments of *O. spilleriae* considered herein as probable forewings. The exception to this uncertainty is specimen UQDE CB14 (Fig.6). It has the proximal regions of AA₃₊₄ and AP widely separated and the stem of AA₁₊₂ clearly developed (both forewing characters of *M. illidgei* and other living psychopsids), and is therefore almost certainly a forewing.

The venational terminology used herein is that of Kukalová-Peck (1983, 1991; see also Lawrence et al., 1991). The following museum abbreviations apply: GSQ, Geological Survey of Queensland; QM, Queensland Museum; UQDE, University of Queensland, Department of Entomology.



FIGS 1,2. *Osmylopsychops spillerae*. 1, Tillyard's reconstruction (1923, text fig.93). 2, Composite of QM F18921 (Fig.5), UQDE CB14 (Fig.6), QM F18922 (Fig.7), and part of GSQ 283a (Fig.4) (proximal sections of ScP, RA, RP, CuA (thicker veins) not drawn to scale).

MATERIAL EXAMINED

Holotype GSQ 314 (central region of ?forewing), 'Osmylopsychops / reevei spilleriae Till. / Holotype / Denmark Hill / Ipswich', '3149.9'; Heautotype [= autotype] GSQ 283a (apical $2/3$ of ?forewing), 'G', 'Osmylopsychops / reevei spilleriae Till. / Heautotype / Denmark Hill / Ipswich / Trias.'; QM F18921 (central region of ?forewing), Mount Crosby Fossil Insect Locality D (collected by K J Lambkin, 20.viii.1972); UQDE CB14 (base of forewing), Mount Crosby Fossil Insect Locality B; QM F18922 (apex of ?forewing), 'L114 Mt Crosby shale / (910805-911805 Ipswich / 1 mile military map - upper bed) / 10.vii.1969 / E. Dahms', [Mount Crosby Fossil Insect Locality C]; QM F18923 (?forewing fragment), Mount Crosby Fossil Insect Locality B (collected by K J Lambkin, 24.viii.1974).

DESCRIPTION OF FOREWING VENATION
(Figs 2-8)

Broad wing of psychopsid type, length c. 18.5mm (Fig.2); costal space quite broad basally, tapering apically (Figs4,5); costal crossveins irregular, mostly deeply forked and extensively branched, almost upright basally, becoming gradually more inclined apically, more closely spaced in 'pterostigmal' area, with a limited series of interconnecting crossveins basally just above ScP (Figs3-7); ScP converging and either ?fused or ?connected by a very short crossvein with RA apically (Figs4,7), entering margin before wing apex; 1 upright scp-ra just beyond radial fork (Figs5,6); ScP, RA and stem of RP curved apically (Fig.2), 1 inclined ra-rp at c. midlength (Fig.5); RP with at least 18 pectinate branches, a few of these forked basally or c. midlength, all with apical branches (Figs4,5,7,8); crossveins of RP field apparently few in number, only 1 or 4 detected (Figs 5,8); MA simple or deeply forked (Figs3,5,6,8); MP occupying a large central area of the wing, its primary forking very close to the base (before that of R - Fig.6), with 6 or 7 branches at midlength (Figs3,5,6), and extensively dichotomously forked apically (Figs5,7); MP₁₊₂ dichotomous in holotype, but in some specimens tending to pectination, in UQDE CB14 this pectination mirroring that of RP (Fig.6); MP₃₊₄ forking a little later than MP₁₊₂ (Figs3,6,8), MP₄ of holotype with an enclosed cell at c. midlength (Fig.3); medial, cubital and anal fields with a few randomly placed crossveins as illustrated in Figs3,5,6,8 (possibly preserva-

tion dependent); CuA extensively dichotomously forked from c. $2/3$ length with branches curved anteriorly (Figs3,5); CuP occupying only a narrow area of the wing, more deeply dichotomously forked than CuA, CuP₁ more deeply forked than CuP₂ (Figs3,5,6); AA₁₊₂ developed as a short spur directed obliquely towards Cu (Fig.6); AA₃₊₄ extensively dichotomously forked from c. $3/4$ length (Fig.6); AP₁₊₂ dichotomously forked from c. $1/2$ length, less extensive than AA₃₊₄ or AP₃₊₄ (Fig.6); AP₃ joined to AP₂ by a short crossvein basally, simple for almost entire length, with 2 small branches apically (Fig.6); AP₄ extensive, occupying as much of the margin as AP₁, AP₂ and AP₃ combined, extensively dichotomously forked with branches directed apically (Fig.6); trichosors present, at least along fore margin (Figs5,6); 1 nygma detected, placed centrally between 2nd and 3rd branches of RP (Fig.5).

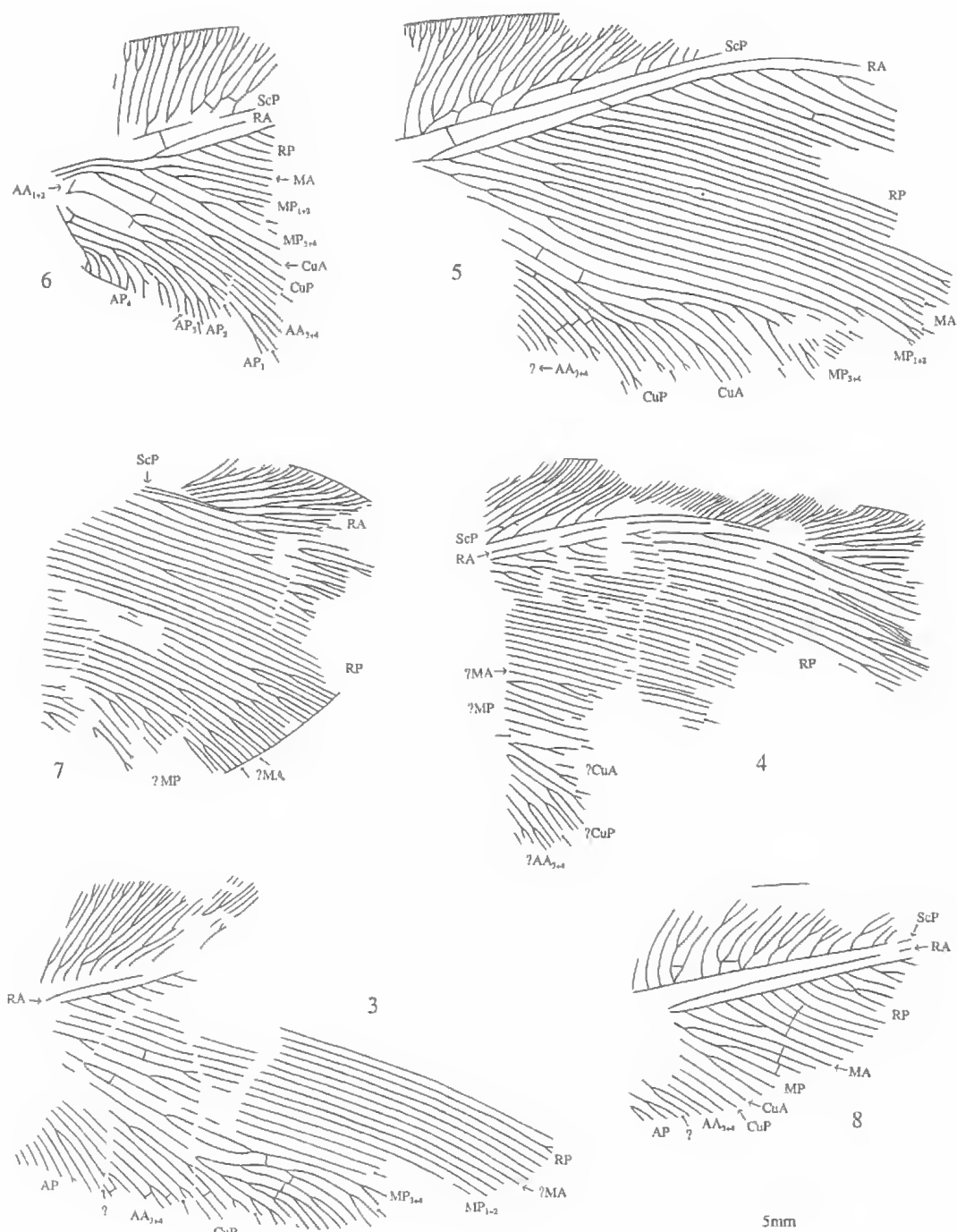
NOTES

Figure 2 is a composite of UQDE CB14 (Fig.6), QM F18921 (Fig.5), QM F18922 (Fig.7), as well as a small part of GSQ 283a (Fig.4) ('pterostigmal' region only). It illustrates the known features of the presumed forewing of *O. spilleriae*. The major differences between this composite and Tillyard's reconstruction (Fig.1) are listed below. Certain features, such as the wing shape and the venation of the humeral region and parts of the fore, apical and hind margins, are not preserved in the material examined and remain unknown.

1. Structure of MP (= M of Tillyard's notation)

Because Tillyard's specimens did not show the important basal structures of the main veins (as now provided by UQDE CB14 - Fig.6), he conjectured that MP was of minor extent with its primary forking well beyond that of R (as is apparently the case in recent psychopsids). The new material indicates that MP forks very early (before the primary radial fork), is multibranched, and occupies a large central area of the wing. The veins shown by Tillyard as the first two branches of RP (Rs of his notation) are indeed part of MP.

The structure of MP in *O. spilleriae* is especially interesting in providing a clue to the homology of 'MP' in the wings of living species of the Psychopsidae. In the forewing of these species there is a variably developed weak posterior branch leaving MP before the primary forking of R, in exactly the same position as MP₃₊₄ in *O. spilleriae*. In larger species (e.g. *M. illidgei*,



FIGS 3-8. *Osmylopsychops spillerae* (proximal sections of ScP, RA, RP, CuA (thicker veins) not drawn to scale). 3, GSQ 314 (holotype). 4, GSQ 283a ('heautotype'). 5, QM F18921. 6, UQDE CB14. 7, QM F18922. 8, QM F18923.

Psychopsis barnardi Tillyard) this branch exists as a very weak vein which peters out after running for a short distance along a fairly deep furrow in the membrane. In species of smaller size the furrow and a kink in the stem at the point of forking (e.g. *P. insolens* McLachlan), or simply the suggestion of a fold in the membrane (e.g. *P. coelivagus* (Walker)), is all that remains. Based on the structure of MP in *O. spilleriae*, the much reduced extreme basal posterior branch of MP described above is the remnant of MP₃₊₄ and the vein system usually labelled as 'MP' in living psychopids is MP₁₊₂ only.

2. Structure of Cu

In Tillyard's reconstruction the primary forking of Cu is a considerable distance from the base, and CuP forks at the same level as CuA and has only three branches. Specimen UQDE CB14 (Fig.6) shows that the primary fork of Cu is placed extreme basally (as occurs in the Psychopidae and most Neuroptera), and that CuP forks much earlier than CuA and has at least six major branches.

3. Structure of A

The anal area in Tillyard's reconstruction is almost entirely conjectural and bears only marginal resemblance to that described herein (see especially Fig.6). The new information shows that the basal sections of Cu→CuP, AA₃₊₄ and AP₁₊₂ are much more widely spaced than in Tillyard's reconstruction; the basal section of AA₃₊₄ is curved anteriorly, not posteriorly; AA₃₊₄ and AP₁₊₂ are not fused at the base; and AP₃₊₄ is smaller in area and has fewer major branches which are directed apically rather than posteriorly.

4. Primary forking of R

Tillyard's reconstruction shows the primary forking of R very close to the base of the wing. UQDE CB14 (Fig.6) shows that R forks much further distally than this, well beyond the primary forkings of Cu and AA₃₊₄.

5. Marginal end-twigging of veins

End-twigging of veins is much more pronounced along the fore and hind margins (see Fig.2) than indicated by Tillyard.

6. Wing proportions

Comparison of Figures 1 and 2 indicates that the presumed forewing of *O. spilleriae* is not as broad as suggested by Tillyard.

The relationships of *O. spilleriae* (and *O. radialis* which, based on the figure of Ellenberger et al. (1953, fig.1), appears to be congeneric) remain problematical. *Osmypsiops* is just one of a large number of diverse Mesozoic psychopid-like wings (see Martynova, 1949, and numerous subsequent descriptions of additional species) that, as a group, requires critical re-examination and reappraisal. What can be said at this stage, however, is that *Osmypsiops* does not possess the set of apomorphic wing features characteristic of the Psychopidae (viz ScP, RA and stem of RP evenly spaced and braced by numerous crossveins; MP₃₊₄ much reduced; CuA and CuP strongly posteriorly pectinate; crossveins mostly aligned into two or three gradate series) and is thus not attributable to that family (see also Riek, 1955).

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